UNITECH enterprise
Building Solutions

Feel the freshness of nature

Hydronic Radiant Cooling (HRC)

Next generation cooling solutions

Hydronic Radiant Cooling

We are proud to introduce Hydronic Radiant Cooling (HRC) System for the first time in India, with technical support from our European partners.

This system completely redefines the cooling experience and in the process saves energy cost by 50%.

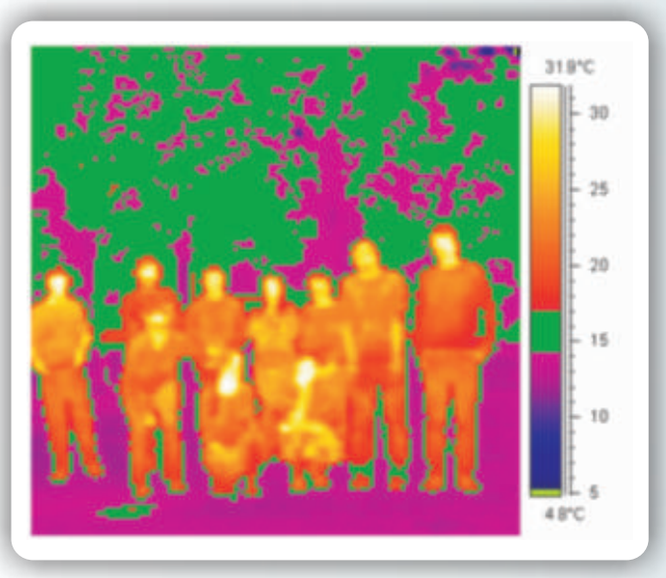
Basic principle

The basic principle of HRC system is cooling through the natural process of thermal radiation as opposed to forced convection (as in conventional air-conditioners).

Thermal radiation is a natural process of transfer of energy from a higher level (warmth) to a lower level (coldness). It happens at the speed of light, does not require any medium to travel in and is the most rapid mode of energy transfer.

The examples below illustrate the principles of thermal radiation

A bottle cooler which cools the cans by thermal radiation although there is no forced convection.



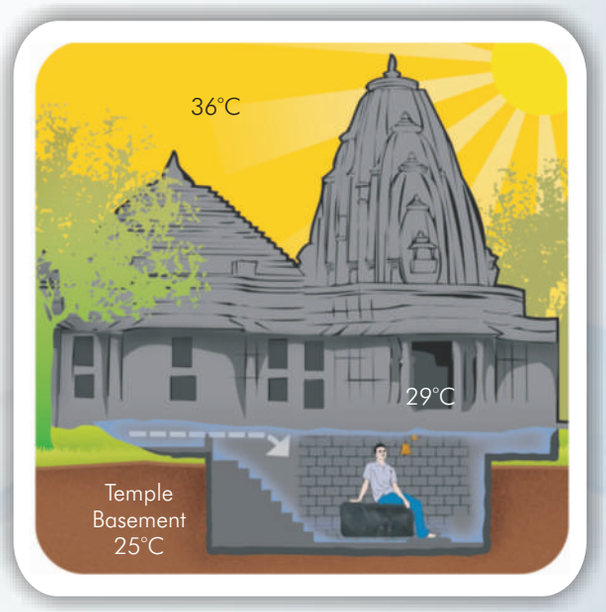
Thermal image of people radiating heat in the cold atmosphere having a temperature of 13^{0}C

In order to achieve a natural cooling comfort, the surface temperature of the ceilings (and walls if necessary) is brought down reasonably below the skin surface temperature of the human body. Heat is drawn from the hotter human body and flows to the cooler surroundings. Due to natural convection the premise air temperature drops closer to the ceiling surface temperature. This results in natural and pleasant cooling with soothing comfort. Similarly all objects within the premise also radiate heat until thermal equilibrium is achieved. This cooling effect is achieved by using climatic grids to cool the ceilings (and walls if necessary) within the premises.

As the picture above illustrates, a person feels hot and uncomfortable when the ceiling and walls are at a similar or at a higher temperature than the human skin surface temperature.

As the temperature of ceiling and walls is brought substantially lower than the human skin surface temperature, thermal radiation starts taking place whereby heat from the human body flows to the cooler surroundings making the person feel comfortable again.

Classic example of natural cooling under thermal radiation



As the pictures above illustrate, the walls and floor of the temple basement remain cool as these are surrounded by cool earth soil. HRC works on the same principle.

Actual working of the system

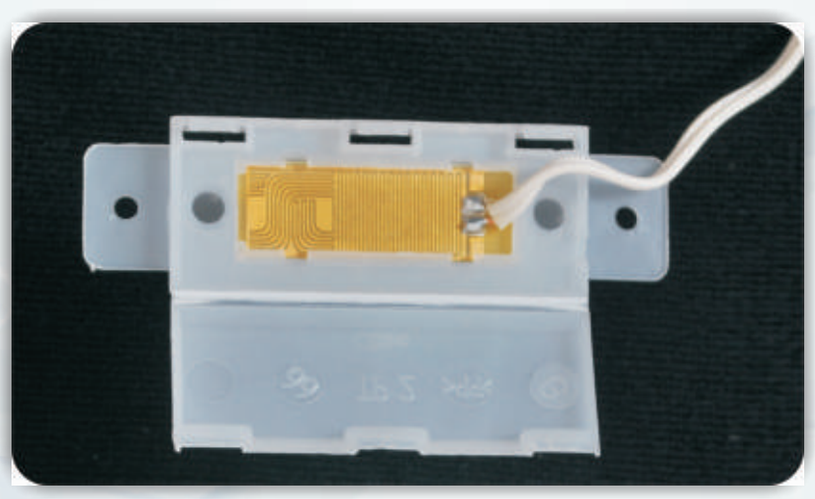
The climatic grids are installed in the ceilings (and walls if necessary) of the premise. Climatic grids are interconnected to form a closed loop. Cold water circulates, through this closed loop, the flow of which is regulated using the control valves. Being a closed loop system, the same water circulates for years without any loss due to evaporation.

Gradually, the wall and ceiling surface temperature will fall substantially below the human skin surface temperature. As this happens, radiation starts taking place. The higher energy (warmth) from the body is transferred to the lower energy (coldness) of the walls and ceilings. This process also cools all the furniture & its contents to a cooler temperature. The air temperature in the premise also gradually reduces due to the natural convection.

The system is designed and installed in such a manner that all the end user has to do is enter the desired temperature of the premise into the climatic controller, which regulates the water flow through the control valves. The grids which are 5 mm thick can be covered with all the usual building materials (marble, granite, ceramic tiles, POP plaster etc.) and even furniture in front of walls has no effect on the cooling output. The concealed fixtures & fittings of any size can be easily integrated along with climatic grids, without any compromise on the aesthetic value.

Control Valve

Thermostat



Dew Point sensor

Advantages of HRC over conventional air-conditioning

- Lower energy costs by 50%.
- Considerably more pleasant method of cooling since there is no draft of cold air.
- No cold air pockets or warm zones thus maintaining a uniform temperature in the premise.
- More hygienic due to reduced duct size thus reducing the possibilities of mould, fungi and dust mites formation, thereby preventing respiratory illnesses.
- Reduced duct size enables reduced ceiling height which in turn saves on construction costs.
- In dry regions this system increases the humidity to 50% - 55% which is suitable for human comfort.
- Due to thermal storage property of HRC system the premise coolness is maintained for hours, even during load shedding.
- Negligible maintenance costs since no moving parts.
- Significantly longer life span (50 years) with a warranty of 10 years.

Cost Comparison

Comparison of HRC with conventional cooling system for 10000 sq. ft. carpet area

Parameters	Hybrid HRC (65% HRC & 35% conventional air conditioners)	Conventional Cooling (Air Conditioners)	Net effect of HRC over Conventional Cooling
Required tonnage	33 TR	66 TR	50% Less
Capital Cost	Rs. 47.5 Lacs	Rs. 20 lacs	140% More
Annual Energy cost (24 X 7 @ 65% X Rs. 7/- per Kwh)	Rs. 18 lacs	Rs. 34 Lacs	47% Less
Annual Mmaintenance cost	Rs. 63,000/-	Rs. 1.2 Lacs	47% Less
Efficiency with aging up to	97%	80%	22% More
Life Span	50 Years	15 Years	235% More
Warranty	10 Years (only on HRC)	1 Years	10 Times More

Payback period with interest @12% P.A.: 2.2 years

HRC Limitations

The system does not remove moisture from the air and does not bring in fresh air. Therefore HRC system is always designed with a marginal supplementary conventional air-conditioner. However, as shown in above calculation example, the overall required total tonnage for a hybrid system will always be around 50% less than that of a conventional air-conditioning system. In regions with low humidity the cooling system can be designed solely with HRC.

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